

## **Short Term Scientific Missions (STSM)**

### **Summary Report**

STSM Coordinator: Prof. Eftihia Nathanail

STSM Committee: Prof. Eftihia Nathanail, Prof. Pnina Plaut, Prof. Bridgette Wessels, Dr. Slaven Gasparovic, Dr. Domokos Esztergar-Kiss

Short Term Scientific Mission (STSM) aim at supporting individual mobility, strengthening the existing networks and fostering collaborations by allowing scientists to visit an institution or laboratory in another Participating COST Country or an approved NNC (Near Neighbour Countries) institution or an approved IPC (International Partners Countries) institution.

STSM applicants must be engaged in a research programme as a PhD student or postdoctoral fellow, or be employed by or officially affiliated to an institution or legal entity, which has within its remit a clear association with performing research. The selection of applicants is based on the scientific scope of the STSM application that must be in line with the Action objectives. Necessary geographical and gender balance issues are taken into consideration and applications from Early Career Investigator (ECI) are privileged.

During the lifetime of the Action, 7 Calls for STSM were published and 25 researchers accomplished successfully their mission.

## COST TU1305: STSM Grantees – Summary table

Name	Country	STSM topic	Host	Host institute and Country		No. of days	STSM Period	Mail
Mr. Emmanouil Chaniotakis	Greece	Capturing the effect of social networks on human mobility behavior using data from Social Media	Prof. Bin Jiang	University of Gavle	SE	19	June, 2015	<a href="mailto:chaniotakis@certh.gr">chaniotakis@certh.gr</a>
Mr. Or Caspi	Israel	Public transportation's coverage of natural city	Prof. Bin Jiang	University of Gavle	SE	11	June 2015	<a href="mailto:orcaspi@gmail.com">orcaspi@gmail.com</a>
Dr. João de Abreu e Silva	Portugal	Influence of web based social networks on individuals travel behaviour	Prof. Juan De Ona	University of Granada	ES	10	July, 2015	<a href="mailto:joao.abreu@civil.ist.utl.pt">joao.abreu@civil.ist.utl.pt</a>
Mr. Matthew Hanchard	UK	Location-based services and urban navigation: a qualitative investigation of transport use in Oslo	Dr. Tom Erik Julsrud	Institute of Transport Economics, Oslo	NO	6	Oct, 2015	<a href="mailto:matthewhanchard@googlemail.com">matthewhanchard@googlemail.com</a>
Dr. Patricia Melo	UK	Home-Based Telework, Residential Location and Intra-Household Dynamics	Dr. João de Abreu e Silva	Instituto Superior Técnico, University of Lisbon	PT	23	Nov – Dec, 2015	<a href="mailto:patricia.melo@hutton.ac.uk">patricia.melo@hutton.ac.uk</a>
Dr. Helen Carter	Denmark	Young Peoples' Mobilities, Socio-Spatial Networks and Urban Space	Prof. Sven Kesselring	Nürtingen-Geislingen University, Geislingen	DE	48	Nov – Dec, 2015	<a href="mailto:helen.carter@tum.de">helen.carter@tum.de</a>
Ms. Rumana Sarker	Austria	The use of social media in public transport to understand the passenger preferences.	Dr. Sigal Kaplan	Technical University of Denmark	DE	61	Feb-April, 2016	<a href="mailto:rumana.sarker@uibk.ac.at">rumana.sarker@uibk.ac.at</a>
Dr. Reza Farahbakhsh	France	iTrip, a Framework to Enhance Urban Mobility by Leveraging Various Data Sources	Prof. Eftihia Nathanail	University of Thessaly, Volos	EL	31	April, 2016	<a href="mailto:reza.farahbakhsh@it-sudparis.eu">reza.farahbakhsh@it-sudparis.eu</a>
Dr. Maria del Mar Alonso	Spain	Use of social networks on travel decision making.	Prof. Claudia Ribeiro De Almeida	University of Algarve, Faro	PT	15	April, 2016	<a href="mailto:mar.alonso@uam.es">mar.alonso@uam.es</a>
Prof. Silvana Stefani	Italy	Opinion dynamics models and complex networks	Prof. Candelaria Gil	Universidad de la Laguna, Tenerife	ES	21	April, 2016	<a href="mailto:silvana.stefani@unimib.it">silvana.stefani@unimib.it</a>
Mr. Francisco Javier Diez de los Rios Mesa	Spain	Study of the interpretation and decision making around mobility by different typologies of passengers.	Dr. Bridgette Wessels	University of Sheffield	UK	90	May-July, 2016	<a href="mailto:Franmesa@ugr.es">Franmesa@ugr.es</a>
Prof. Ana Margarida Barreto	Portugal	Predicting and Changing Travel Behaviour	Prof. Silvana Stefani	Università degli Studi di Milano-Bicocca	IT	13	Sep, 2016	<a href="mailto:ambarreto@fcsh.unl.pt">ambarreto@fcsh.unl.pt</a>

Name	Country	STSM topic	Host	Host institute and Country		No. of days	STSM Period	Mail
Dr. Reza Farahbakhsh	France	Enhance Urban Mobility by using available data sources	Prof. Eftihia Nathanail	University of Thessaly, Volos	EL	31	Oct-Nov, 2016	<a href="mailto:reza.farahbakhsh@it-sudparis.eu">reza.farahbakhsh@it-sudparis.eu</a>
Dr. Ainoa Serna	Spain	Innovative Travel data collection methods for Transport Planning	Dr. Odette Lewis	University of Malta	MT	52	Sep – Oct, 2016	<a href="mailto:aserna@mondragon.edu">aserna@mondragon.edu</a>
Mr. Ioannis Karakikes	Greece	How travelers' behavior affects urban freight distribution	Dr. Mihails Savrasovs	Transport & Telecommunication Institute	LV	7	Sept, 2017	<a href="mailto:iokaraki@uth.gr">iokaraki@uth.gr</a>
Mr. Vishnu Barajan	Portugal	Labeled data versus likert scales, analyzing its effect in the collection of travel behavior and ICT information	Prof. Francisco Pereira	Technical University of Denmark	DK	42	Sep-Oct, 2017	<a href="mailto:vishnu.baburajan@tecnico.ulisboa.pt">vishnu.baburajan@tecnico.ulisboa.pt</a>
Dr. Ainhoa Serna	Spain	Transport survey method: using Social Media Big Data to study Travel Behaviour	Dr. Slaven Gasparovic	University of Zagreb	HR	32	Oct-Nov, 2017	<a href="mailto:aserna@mondragon.edu">aserna@mondragon.edu</a>
Prof. Lidia Zakowska	Poland	Social Networks and Human Behaviour	Prof. Francesco Viti	University of Luxembourg	LU	12	Nov 2017	<a href="mailto:izakowsk@pk.edu.pl">izakowsk@pk.edu.pl</a>
Mr. Arkadiusz Drabicki	Poland	Investigation of impact of real-time crowding information systems on passengers' travel behaviour in public transport networks – SP survey design and validation	Prof. Achille Fonzone,	Edinburgh Napier University, Edinburgh	UK	21	Nov 2017	<a href="mailto:arkadiusz.drabicki@gmail.com">arkadiusz.drabicki@gmail.com</a>
Dr. Stefano Pensa	Italy	Social Networks, Social Media usage & Travel Behavior among students in EU countries – Urban data analysis	Prof. Pnina Plaut	Technion	IL	11	Nov - Dec. 2017	<a href="mailto:stefano.pensa@polito.it">stefano.pensa@polito.it</a>
David Duran Rodes	Germany	Identification of leisure mobility patterns related to the use of social media	Prof. Pnina Plaut	Technion	IL	17	Nov-Dec 2017	<a href="mailto:davidduran@hotmail.com">davidduran@hotmail.com</a>
Yuval Rubinstein	Israel	Social network - urban data analysis	Dr. Stefano Pensa	SiTI – Torino	IT	15	Dec. 2017	<a href="mailto:yuvrub@gmail.com">yuvrub@gmail.com</a>
Dr. Domokos Esztergar - Kiss	Hungary	EU funded research projects in the field of Social networks and travel behaviour	Dr. Odette Lewis	University of Malta	MT	15	Jan 2108	<a href="mailto:esztergar@mail.bme.hu">esztergar@mail.bme.hu</a>
Dr. Fariya Sharmeen	Netherlands	On the mutual transposition of individuals' social and travel geographies	Prof. Mario Cools	Univeristy of Liege	BE	92	Nov 2017- Jan 2018	<a href="mailto:F.Sharmeen@fm.ru.nl">F.Sharmeen@fm.ru.nl</a>
Mr. Jesper Bláfoss Ingvardson	Denmark	The influence of perceived fairness, equity and social networks on location patterns and public transport use	Prof. João de Abreu e Silva	Instituto Superior Técnico, University of Lisbon	PT	28	Jan 2018	<a href="mailto:jbin@dtu.dk">jbin@dtu.dk</a>

## 1. Mr. Emmanouil Chaniotakis National Technical University of Athens (EL)

**Period:** 8/6/2015 – 26/6/2105

**Host:** Professor Bin Jiang. Faculty of Engineering and Sustainable Development, Division of Geomatics. University of Gävle, Sweden

**STSM topic:** Capturing the effect of social networks on human mobility behaviour using data from Social Media

### **Purpose**

The main goal of this proposed STSM is to use data collected from Social Networking Services (SNS) to extract human mobility data that can be used in inferring human mobility activities and patterns. In the period leading to the STSM, preliminary data collection and analysis activities will be performed, to identify candidate locations for the analysis, as well as narrow down the methodological components of the research. This data would originate mainly from the open Twitter data and more specifically the georeferenced tweets of the chosen area. The data collected is going to be further analysed, in order to examine the capability of inferring activities and the related trips of the SNS users using content analysis tools. For each user collected data on their social network is also going to be used, in order to identify the capability of SNS on transportation related social network effects. Using activities, location and social network, analysis is going to be performed on transportation mobility patterns and the methodology of defining the effect social networks might have to the transport related choices.

### **Main results**

More specifically on the results, it is believed that the existence of areas that are not represented by POIs indicates the advantages of exploring further this option for deriving dynamic AoI that can be used in transportation related models and applications. It is believed that this dynamic character might allow for the identification of the system that governs the choice of locations to be visited.

Furthermore the derivation of trips and the exploration of the distributional behaviour is also promising for understanding the behaviour of users tweeting from different locations and deriving trips based on the posted tweets. Although we did not found a clear scale-free behaviour that would allow for modelling trips derived in a scale-free context we believe that this is mainly due to the sample used and that larger samples should be explored for understanding the tweeting process that individuals undertake related to travel behaviour. This would allow for future investigation of the social networks in travel behaviour using social media.

## 2. Mr. Or Caspi, Technion - Israel Institute of Technology (IL)

**Period:** 14/6/2015 24/6/2015

**Host:** Professor Bin Jiang. Faculty of Engineering and Sustainable Development, Division of Geomatics. University of Gävle, Sweden.

**STSM topic:** Public transportation`s coverage of natural city: exploring twitter data for better understanding hotspots and public transportation.

### **Purpose**

The aim of this STSM is to find whether the public transportation system in the City of London provide a satisfying coverage for the natural city of London, defined by its human activities. We chose to study London, United Kingdom, because of its very complex and well-established public transportation system. In this research, we focused on the city level and instead of using natural cities, we delineated patches of massive human activity within the city into natural hotspots. We defined these hotspots using one week's worth of Twitter data from the Greater London area. Twitter is a very popular social network that is used by a large variety of people across the United Kingdom, and thanks to its high spatial data availability, its data complimented our research objectives. We identified the hotspots and examined whether or not they followed the power law distribution. These hotspots were classified into different hierarchical levels using the head/tail breaks. Those in the head are more attractive, while those in the tail are less attractive. Then we superimposed the city's public transportation data on the top of the hotspots in order to examine the spatial factors of the public transportation's availability and to determine whether or not the city's public transportation covers human activity hotspots adequately.

Our research gives a new examination method for public transportation's efficiency by revealing the real patterns of human activity in the city and shows the gaps between the required and the actual public transportation's coverage.

### **Main results**

We found that more than 99% of the tweet locations are within a reasonable walking distance from transit service. The main lines that cross many other routes cover more tweets relative to their measure of connectivity. We also found that most of the main hotspots are served well by the public transportation system. Our conclusions suggest a high level of efficiency in London's public transportation system.

Although London has a highly developed public transportation system, this method can also be applied in other natural cities with less complex public transportation systems. This method can be used to determine the areas in a city that require better service and also which areas have excessive services; allowing a city to use its resources most efficiently.

### **3. Prof. João António de Abreu e Silva, Instituto Superior Técnico, Lisbon, (PT)**

**Period:** 1/7/2015 – 10/7/2015

**Host:** Prof. Juan de Oña, TRYSE Research Group - University of Granada Spain

**STSM topic:** Development of a web survey about travel behaviour and the use of web based social networks.

#### **Purpose**

This STSM had the following main interrelated objectives/tasks:

1. To perform a literature review about the influence of web based social networks on individuals travel behavior,
2. Based on the literature review, propose a conceptual model to be tested with purportedly collected data.
3. Design and implement a web survey about travel behavior and the use of web based social networks to be applied in several cities in Europe, the first candidates could be Lisbon, Granada, Copenhagen and Zagreb.

Based on the literature review, and on the answers of a previous simplified questionnaire about the relation of ICT usage and travel behavior it was decided to focus on social travel and the use of ICT and web based social networks and social media.

#### **Main results**

Previous literature relates several characteristics on social networks with travel behavior, in particular with travel related with social activities. Also, the relations between the use of ICT and travel behavior have been studied in the literature in particular the possibility that ICT's could substitute travel, complement travel or could eventually being neutral. As a result and based on these elements a series of potential research questions that the survey should contribute to respond were defined. These are the following:

- The nature of the relations between ICT and social media usage, and face to face social activities, are they complementary neutral or there are substitution effects?
- How do the use of social media and ICT interacts with social networks?
- How land use patterns interact with ICT usage and social activities? And how both contribute to a reduction or an increase in the activity space of students?
- How does the perception about the utility of social media and ICT and the satisfaction about its use relates to its usage for travel purposes?
- Does the use of ICT and social media contributes to more efficient travel?

Based on the literature review and on the research questions the final version of questionnaire was designed. The survey is planned to be implemented in three European cities at three universities: Lisbon, Granada and Zagreb.

Several hypothesis are been put forward when relating the use of ICT and travel behavior. One of the first was that the use of ICT would substitute travel. In general the hypothesis relating travel behavior and the use of ICT comprehend the following relations (Salomon, 2000, Mokhtarian and Salomon, 20002; Aguilera et al.,2014):

- Substitution;
- Generation, either by complementarity or by stimulation;
- Modification;
- Neutrality.

Several studies, in the context of different travel purposes (with a particular focus on social travel) and sociodemographic groups, tried to look at the relations between ICT and travel. Some examples include: van der berg et al (2013), Nobilis and Lenz, (2009); Yuan et al., (2009); Hjorthol and Gripsrud, (2009); Kourounioti et al. (2015); Kamargianni, and Polydoropoulou (2014); Wee et al. (2013); Sasaki and Nishii (2010); Paez and Scott, 2014; Lyne et al.,(2011).

Particularly relevant in this context is also the concept of activity fragmentation (Ben-Elia et al., 2014) - which could affect travel scheduling, activity participation and location, and multitasking (Kenyon and Lyons, 2007). Parallel to these analyses several studies looked at the composition and characteristics of social networks and social travel (Carrasco et al, 2008; Lin and Wang, 2014; Axhausen, 2008; Arentze and, Timmermans, 2008) and also its relations with ICT and land use patterns (Wang an Lin, 2013; Kwan, 2007).

#### **4. Mr. Matthew Hanchard, Dept. of Sociological Studies University of Sheffield, (UK)**

**Period:** 26/10/2015 to 30/10/2015

**Host:** Tom Julsrud, Institute of Transport Economics, Oslo (NO)

**STSM Topic:** Location-based services and urban navigation: a qualitative investigation of transport use in Oslo

##### **Purpose**

There were two purposes to this STSM: The first was primarily a means to carry out fieldwork. The five days allowed time to carry out five qualitative interviews, transcribe all relevant sections, and carry out analysis using the pre-existing coding scheme from my PhD. The second, was to build a relationship with the host institution and supervisor as a platform for future work.

As tangible objectives, and ongoing work beyond the STSM, I plan to draw out a deeper analysis of the findings, and work collaboratively with the host supervisor in order to draft a short research paper/report for the STSM. This will be submitted by July 2016.

##### **Main results**

There were several interesting findings drawn from interviews, which will be elaborated on in short research paper/report. For example, following the pre-set coding scheme, three are of interest to potential future work:

1. *Generational differences in the organisation of social networks* - Age does not necessarily

stratify social media use, but rather social networks amongst older participants hold more rigidly hierarchical structures with 'group leaders' carrying out a centralised function or social role as information source. Often, social media used as one means amongst many for communication. This contrasts younger interviewees' accounts of a more horizontally organised set of relations amongst social network members, that use social media extensively - commensurable with network theory.

**2. Diverse levels of ICT engagement in everyday travel routines** - In planning travel routes, there are a diverse range of engagement levels with ICT's. This should not to be conflated with technological capability, or access to digital resources.

**3. Online-offline entanglement of resources** - In making decisions on what to do, and where to go, social networks are central - both for gaining information and to co-ordinate activity. Social networks can be both online and offline. To understand how social networks are incorporated into everyday life and the effect on travel behaviour, it is important to understand how online-offline entanglements are negotiated.

## **5. Dr. Helen Carter, Aalborg University, Aalborg (DK)**

**Period:** 1/11/2015 to 18/12/2015

**Host:** Sven Kesselring, Nürtingen-Geislingen University, Geislingen (DE)

**STSM Topic:** Young People's Mobilities, Socio-Spatial Networks and Urban Space

### **Purpose:**

The purpose of the STSM was to work on a review of existing literature on young people's mobilities, socio-spatial networks and place, together with beginning to develop concepts and methodologies for researching the connections between these areas. The work was specifically proposed to cover a literature review, work on qualitative visualization methodologies and groundwork for further collaboration with Professor Kesselring and participation within the wider COST Action.

### **Main results**

I can make some initial conclusions regarding gaps in the literature which could be addressed in future research on young people and mobilities.

The first conclusion is the need for an increased focus on the holistic study of different forms of mobilities, through focusing on virtual and communicative mobilities, as well as physical mobilities. Although this is becoming increasingly common, the starting point of studies is often physical mobility, which is then subsequently connected to other forms of mobilities.

This leads to the second conclusion – that an implicit focus on physical mobility as a starting point leads to a definition of physically mobile people as the de facto interesting individuals for study. This means there is often an exclusion of those who are apparently 'physically immobile', and the study of how they use different forms of mobilities.



Finally, there is a wide variety of literature on different types of transnational mobilities of young people, which points to many interesting debates regarding mobilities, identities, belonging and relations to place, but there is potential for greater consideration of the regional, urban and rural mobilities of young people, where similar ideas could potentially be applied and debates taken up for discussion.

These conclusions are anticipated to form the basis of potential future research in the area of young people's mobilities and socio-spatial networks, working at the intersection of geography, sociology and urban planning.

## **6. Dr. Patricia Melo, The James Hutton Institute, Aberdeen (UK)**

**Period:** 16/11/2015 to 7/12/2015

**Host:** João de Abreu e Silva, Instituto Superior Técnico, University of Lisbon, Lisbon (PT)

**STSM Topic:** Home-Based Telework, Residential Location and Intra-Household Dynamics

### **Purpose**

The aim of the STSM was to investigate the impacts of home-based teleworking on travel behaviour and residential location using individual and household data. The STSM had the following main objectives:

1. Carry out a literature review on home-based teleworking and its effects on travel behaviour and residential land use patterns.
2. Measure the indirect impact of home-based teleworking on partner's travel (work and non-work travel).
3. Examine the potential land use effects of home-based teleworking relating to urban sprawl and counterurbanisation, by estimating the relationship between residential location and home-based teleworking.

### **Main results**

The main findings obtained from the regression analyses are summarized below:

- Home teleworkers, and their households, have longer one-way commute distances and journey times, compared to non-teleworkers and their households.
- The longer total household commutes derive exclusively from the longer commute distances and travel times of home teleworkers, and there is no compensation effect from reduced commute distance and travel time of the partners of home teleworkers. That is, non-teleworker's commute distances and travel times are not statistically significantly affected by his/her partner's home telework status.
- Despite the increase in the proportion of workers using home telework, from 3.8% in 2005 to 5.9% in 2012, the magnitude of the effect does not seem to have changed over the period studied.

These findings have some implications for urban policy and spatial planning, principally policies relating land use and transport interactions. In particular, the results suggest that the possibility of working from home might affect residential location decisions of individuals to live further away from their places of work, and consequently make fewer but longer trips. This, in turn, can contribute to more urban sprawl especially in the context of a greater centralization of jobs compared to (greater decentralization of) residences and thus can also be associated with an increased jobs-household imbalance and excessive commuting (e.g. Chowdhury et al., 2013). However, the analysis carried out does not allow testing directly the hypothesis that households with home teleworkers are more likely to live in suburban and peri-urban areas of large cities and metropolitan areas.

## **7. Ms. Rumana Islam Sarker, Institute for infrastructure, Unit for intelligent transport systems, University of Innsbruck (AT)**

**Period:** 5/2/2016 to 5/4/2016

**Host:** Sigal Kaplan, DTU-Transport, Technical University of Denmark, Lyngby (DK)

**STSM Topic:** **The use of social media in public transport to understand the passenger preferences**

### **Purpose:**

This STSM had the following main interrelated objectives/tasks:

- Conducting a thorough literature review regarding the role of social networks and social media platforms for receiving and sharing transit information
- Proposing a conceptual framework for analysing the factors underlying the willingness to share and receive transit information across transit users via virtual platforms and networks. A new methodological approach has been explored by combining elements from Ajzen's Theory of Planned Behavior, Davis's Technology Acceptance Model, Schwartz's Norm Activation Model and Alderfer's ERG model.
- Developing and designing a survey on the basis of the proposed behavioural framework to be administered in Austria and Denmark.
- Establishing cross-national collaboration between Denmark, Austria and the Netherlands and a cross disciplinary collaboration between psychologists and transport modellers.
- Preparing abstract and submitting to the European Regional Science Association Congress (ERSA 2016) to be held in Vienna, 23-26 August 2016. The title of the paper is "The use of social media in public transport to understand the passenger preferences and increase the user satisfaction" co authored by Rumana Islam Sarker, Sigal Kaplan, Sonja Haustein and Otto Anker Nielsen
- Preparing another abstract and submitting to the European Association for Research in Transportation (hEAR2016) conference to be held in Delft, The Netherlands, 14 - 16

September 2016. The paper title is “Understanding transit user’s intention to voluntarily share transit information through social media” co-authored by Rumana Islam Sarker, Sigal Kaplan, Sonja Haustein, Otto Anker Nielsen, Harry J. P. Timmermans.

**Main results**

The working visit resulted in an innovative conceptual framework and a quantitative model to understand one’s own information needs, recognizing the information needs of others and the transformation process. This will enable users to move from passive to active by sharing information, which is a crucial element in the success of PT systems. The formulation of conceptual framework was complex and it is till date first of its kind in transport planning. It is expected that, this survey will help to understand if encouraging reciprocity and active involvement of users by enabling them to share information can increase consumer loyalty and information quality. It will also identify whether with the help of social media, people can obtain information about alternatives and update their expectations of the outcomes of their choices from their social network members.

As the survey is expected to conduct from 25.04.2016, considering the two countries, the required sample size is roughly 500 completed questionnaires for each country. The hypothesized behavioural framework will be investigated by formulating a structural equation model (SEM) of the need to model simultaneously endogenous latent constructs, their relationship with exogenous observed variables, and their correlation pattern.

**8. Dr. Reza Farahbakhsh, Institut Mines Telecom, Telecom Sud Paris, CNRS Lab (FR)**

**Period:** 26/4/2016 to 30/4/2016

**Host:** Eftihia Nathanail, University of Thessaly, Volos (EL)

**STSM Topic:** iTrip, a Framework to Enhance Urban Mobility by Leveraging Various Data Sources

**Purpose:**

In this research work, we aim to provide a framework to enhance urban mobility by leveraging all these various source of data and provide different range of services to different group of customers.

**Main results:**

The framework introduced in this research work, namely iTrip, provides various types of innovations that can be implemented for providing different services for different customers in urban mobility. Firstly we overview comprehensively the literature and identified some existing gaps. Next we propose a framework including different modules and component. The iTrip framework is an integration of all these studies with a rich information set that can be used to implement very accurate decision making systems with new technologies such as cloud based IoT analysis systems. Lastly a list of future ideas is proposed based on the iTrip framework.

**9. Dr. Maria del Mar Alonso Almeida, Autonomous University, Madrid (ES)****Period:** 17/4/2016 to 30/4/2016**Host:** Claudia Ribeiro de Almeida, University of Algarve (PT)**STSM Topic:** Use of social networks on travel decision making**Purpose:**

- Understanding the link between social networks and travel behavior in the context of leisure travel.
- Creating a measure tool in order to collect information.
- Diffusing the questionnaire.
- Analyzing the data collected.
- Writing the report and diffusing the results.
- Working together in the chapters of the book “Social networks, mobility and urban form” which results from the Working Group 1 meetings (Cost Action TU 1305).

**Main results**

A pre-test of the questionnaire was conducted in Spain and in Portugal among bachelor students. A total of 58 questionnaires were filled, 36 in Portuguese and 22 in Spanish. The report only contains some relevant questions but it will be widened with the rest of information for the deliverables developed as fruit of this STSM. Questionnaire contained information about type and source of information before, during and after the trip. Also, WhatsApp use was asked. Some of the main results are discussed in the report.

**10. Prof. Silvana Stefani, Università Milano Bicocca, Milano (IT)****Period:** 11/4/2016 to 30/4/2016**Host:** Candelaria Gil, Universidad de la Laguna, Tenerife (ES)**STSM Topic:** Opinion dynamics models and complex networks**Purpose**

This STSM aimed at generating a collected bibliography and understanding models of opinion dynamics especially in social fields and related issues.

**Main results**

The research with Candelaria Gil Fariña has been conducted along two parallel topics:

1. **From the theoretical point of view:** the conditions under which the system may converge towards a uniform opinion or fragmented consensus have been studied. Taking some results from Markov chains theory, it is possible to show that if the network is strongly connected, uniform consensus may be reached. Extending this known result to weakly connected networks or even non connected networks is hard. Berger's Theorem (1975) gives necessary and sufficient conditions for a uniform consensus when there may be absorbing states in the system. In terms

of networks, this corresponds to the case in which the adjacency matrix is reducible, i.e. the system is at best weakly connected. In this setting, it may be helpful to recur to the Gantmacher form of a square matrix. The essential classes (and inessential classes) may correspond to absorbing states (or transient states). Logically, the central agents should locate in the essential classes. As a consequence, to check for consensus, it would be enough to check on essential classes. In fact, Berger's theorem shows that inessential agents do not count in forming consensus. However, the concept of centrality (hubs and authorities) is not so clear cut as in the strongly connected case. Through simulation and using the most known type of networks (Erdos-Renyi, Random, small worlds,...), we have built counterexamples where eigencentral agents are located in inessential classes and other examples where essential agents are pendant nodes. Thus, new concepts of centrality must be introduced, like centrality for communities (block centrality) or eigen-indegree – combined centrality. This may be interesting since, in the case of a constant attention, “central” agents can be detected at once and consensus, or at least a majority, can be obtained just by looking closely at those central/essential agents. Another possible way is to apply the Page Rank algorithm (the Google algorithm for net surfing) for overcoming to get stuck into an absorbing state. In other words, the system becomes strongly connected, even if in fact it is not at the beginning. This may have practical and sound applications. However, this may introduce biases since the system changes.

**2. From the application point of view:** Candelaria Gil takes part of a national project titled “Big data, social networks and data journalism: using computer tools for sources and journalistic content analysis” (01/01/2014 - 31/12/2017: Chief Researcher: Carlos Elías, Universidad Carlos III, Madrid). The project focuses on Big data analysis and the application of some digital tools for monitoring data in order to detect behavioural patterns and relevant trends in the flows of information that are generated in the social networks. She is also interested in the issue of opinion dynamics and related topics in various fields, not necessarily related to urban mobility, for instance, biology, psychology and periodism. In particular, this last field may have interesting relationship with urban mobility. While the theory of opinion dynamics is somehow established and it is easy to proceed towards extensions of it, the applications may hide in a lot of different publication sites and journals. However, this is exactly what we are investigating, that is finding applications that are not even seen as opinion dynamics but in fact they are.

The results of this investigation on different fronts will be part of future articles and of the Chapter of the book “Social Networks in Mobility and Urban Environment” that will be published within this same COST project and of which I am the coauthor of the chapter, Opinion Dynamics Models and Complex Networks.

**11. Mr. Francisco Javier Diez de los Rios Mesa, Universidad de Granada (ES)****Period:** 1/5/2016 – 29/7/2016**Host:** Bridgette Wessels, University of Sheffield, Sheffield (UK)**STSM Topic:** Study of interpretation and decision making around mobility by different typologies of passengers**Purpose:**

Our goal with this STSM was to contribute to the exchange of different personal experiences and to assess the role of Social Media on travel behaviour in different urban settings.

This STSM had 5 main interrelated tasks:

1. Literature review on decision making.
2. Identify existing data sets on trip patterns in 2 different scenarios: (a) extra demand on travel services i.e. extra demand due to refugee travel; (b) multiple routine trips in travel i.e. travelling across Sheffield City region. Only, in the second scenario was possible to identify data sets.
3. Explore if social media such as twitter, Instagram, Facebook, etc., can inform our understanding of decision making in travel.
4. Design and conduct qualitative interviews, specifically, semi-structured interviews with passengers (10 in each scenario) and with transport providers in each scenario (5 in each scenario). Only 10 passengers and 2 transport providers were interviewed in the second scenario (Sheffield City region).
5. Develop a survey based on the extracted conclusions from semi-structure interviews.
6. Analyze and develop a preliminary model of decision making based on qualitative data and assess how researching on travel decision making can be further developed by large scale quantitative analysis.

**Main results**

The current literature in this area is lacking. One possible reason is that field has started to be researched in the beginning of this century. The brief literature shows that Social Media has three main functions: The first one is like a source of data. Operators and other companies use Social Media like a useful tool to extract different kind of data (e.g. opinions, patterns, behaviours, etc). This fact allows to develop strategies of marketing which are focused on specific profiles or take decisions about how the company should work or improve their services. The answers in the operators' interviews show that the PT operators are starting to use Social Media in this way. Passengers' feedbacks are current used by them in order to improve their services.

The second one is like a variable. Operators and researchers use Social Media in studies about service quality, to understand travel behaviour, develop models of mobility, etc. Although, it can be a useful way of using Social Media, operators do not use it currently. It is possible to extract from operators' interviews that they do not have integrated this aspect in their researches. In

the best of the cases, they ask about their performance through social media in satisfaction passenger surveys.

And finally, like a way of communication in disruption events. Although Social media used to be used in this way in habitual situations too, like a customer service. This is the main function of Social Media for PT operators. In the interviews, they said that is crucial Social Media in order to help passengers and provide quick information in disruption events. It is important to highlight that in the survey, passengers showed that they are not satisfied with the current service of operators in disruptions events and it is an aspects should be improved.

The answers in the passengers' interviews show Social Media is totally integrate in the lifestyle of young people and, PT represents a crucial support in order to do social activities. Another interesting point is the use of Social Media in the journeys. People difference two main uses: Social Media to organize the activity and Google Maps, PT Apps or Websites to plan the journey.

## **12. Dr. Ana Margarida Barreto, NOVA University, Lisbon (PT)**

**Period:** 12/9/2016 – 24/9/2016

**Host:** Silvana Stefani, Università degli Studi di Milano-Bicocca, Milan (IT)

**STSM Topic:** Predicting and Changing Travel Behaviour

### **Purpose**

- a) Foster new academic collaborations,
- b) Investigate the current state of the art,
- c) Continue designing and implement empirical research studies, meaning to continue working in a research proposal to pursue further in time.

Our aim is to provide with further understanding of consumer decision- making process in this domain, at individual and social level and to identify possible different travel behavior patterns. A major challenge is to develop models for ICT-impacts, combining behavioral realism with (econometric) tractability. These findings are expected to contribute to future communication campaigns on urban mobility.

### **Main results**

- Clear formulation of the research problem
- Specification of a the dependent and independent variables
- Preliminary exploration of an empirical research design.
- Initial steps towards the implementation and evaluation of the research proposal.

## **13. Dr. Reza Farahbakhsh, Institut Mines Telecom, Telecom SudParis, CNRS Lab (FR)**

**Period:** 15/9/2016 – 15/10/2016 (actual 30/9/2016 – 8/10/2016)

**Host:** Eftihia Nathanail, University of Thessaly (TTLog), Volos (EL)

**STSM Topic:** Enhance Urban Mobility by using available data sources

**Purpose:**

- Extend the proposed framework in the previous STSM in modules based on available data categories
- Setting the roadmap for implementing the proposed framework in future.
- Extended literature review

**Main results**

The framework introduced in this research work, namely iTrip, provides various types of innovations that can be implemented for providing different services for different customers in urban mobility. Firstly we overview comprehensively the literature and identified some existing gaps. Next we propose a framework including different modules and component. The iTrip framework is an integration of all these studies with a rich information set that can be used to implement very accurate decision making systems with new technologies such as cloud based IoT analysis systems. Lastly a list of future ideas is proposed based on the iTrip framework.

**14. Dr. Ainhoa Serna, MONDRAGON UNIBERTSITATEA, Arrasate-Mondragon (ES)**

**Period:** 11/9/2016 - 31/10/2016

**Host:** Odette Lewis, University of Malta, Msida MSD 2080 (MT)

**STSM Topic:** Innovative Travel Data Collection Methods for Transport Planning

**Purpose:**

The availability of mobility information based on social networks will contribute positively to studies of Transportation Planning and the ongoing work carried out by the University of Malta regarding the preparation of reports relating to mobility plans, service plans of public road transport and mobility studies in general.

Dr. Ainhoa Serna will contribute with using online social networks to study the characteristics of tourist destinations as an explanatory factor of mobility for leisure reason. The results of the stay will be especially useful in areas related to the mobility of people in urban areas, especially public administrations with responsibility for urban transport.

**Main results**

The Work Plan has been fulfilled, including the identification of the data sources with user generated content; the measure the quality and quantity of the data, the identification of the data gathering techniques and tools for each source; the analysis of the data Through Conceptual framework, taxonomy, natural language processing (NLP) techniques and sentiment analysis; the Design of the persistence layer, defining the appropriate formats depending on the type, quantity and dynamic characteristics of each data. Finally, the Integration of heterogeneous data to homogenize all information.



The number of topics related to mobility is relevant on Traveller social networks (TripAdvisor,) since social media is a great tool for communication and meeting point. The analysis of that type of information can be very important for travel behaviour analysis.

Information and Communication Technologies (ICT) offer the opportunity to improve traditional survey methods to collect travel behaviour data, decreasing bias in the data, reducing respondent burden, and increasing data quality.

Social media have become a valuable source for knowledge but there is a big gap in the automatic Sentiment Analysis with Semantic taxonomy annotation of online textual content. Specifically, the UKB and morphosyntactically Analyser inexistent for some languages. UKB is a collection of programs for performing graph-based Word Sense Disambiguation (WSD) and lexical similarity/relatedness using a pre-existing knowledge base.

The type and focus of discourse has to be with the type of social media. In this sense, as TripAdvisor is a network of travellers, it makes sense that the highlight is the experience and the person who helps building that experience, the guide. Positive and memorable experiences have an important presence in TripAdvisor. In Twitter and Facebook users in general are local users writing daily experiences. In TripAdvisor incidents are almost non-existent. The type of discourse does not depend only on the type of user but on the channel. Significantly, the comments of TripAdvisor are mainly positive. The experience usually depends on the type of user, i.e. daily user or tourist, since for the latter ones are mainly leisure experiences, which means better organization with a guide and other facilities that make the user enjoy the destination.

Our approach enriches the data of the traditional surveys, extends traditional analysis with Big-Data methods, using data mining algorithms and Natural Language Processing techniques to extract urban mobility information from Social Media data.

## **15. Mr. Ioannis Karakikes, University of Thessaly, TTLog (EL)**

**Period:** 17/9/2017 - 23/9/2017

**Host:** Mihails Savrasovs, Transport and Telecommunication Institute (LT)

**STSM Topic:** How travelers' behavior affects urban freight distribution

### **Purpose:**

The main goal of this STSM was to shape an idea about modeling and evaluating a number of smart logistics solutions, considering also travelers' behavior change. This would be achieved by deploying different "what if" scenarios in a traffic micro simulation tool (VISSIM) and a multi-method simulation software (AnyLogic), that the Host Institute uses. The integration of the interfaces of the two different simulation softwares (VISSIM and AnyLogic) was also a goal of this STSM. By completing the integration, we will have the chance to explore any modeling possibilities that may arise from it and investigate how it can contribute to the achievement of the main goal.

This STSM aimed also at setting the grounds for future collaborations

**Main results**

By changing the values of various input parameters of the model (see below) and comparing the base scenario with “what if scenarios” we were able to see the improvement or deterioration achieved. Specifically, in the abstract model a 10% decrease in (1) & (2) and a 10% increase in (3) & (5) indicated a 4,5% decrease in CO2 emission of the designed network.

Input parameters that were altered in the “what if scenarios”

- 1) Volume of the transferred cargo
- 2) Number of distribution vehicles
- 3) Capacity of the cargo vehicles
- 4) Geometrical characteristics of the UCC (entrance location, number of loading/unloading bays)
- 5) Traffic volumes on the transport network around the UCC

The effort of integrating the interfaces of the two softwares is on-going.

**16. Mr. Vishnu Baburajan, Instituto Superior Tecnico (PT)**

**Period:** 20/09/2017 - 31/10/2017

**Host:** Francisco Pereira, Technical University of Denmark (DK)

**STSM Topic:** Labeled data versus likert scales, analyzing its effect in the collection of travel behavior and ICT information

**Purpose:**

The objective of the STSM was to propose and develop a framework to compare the responses from Likert scale with those of open-ended questions. The second objective focused on estimating the loss of information with the use of Likert scales, over open-ended questions. This would allow researchers to address issues related to both the approaches and improve the quality of data collection.

**Main results**

To better understand the state-of-the-art, a literature review focusing on use of Likert scales and open-ended questions to measure attitudes and their associated issues were carried out. In addition to this, the developments in the field of Machine Learning, importantly in topic modelling was also carried out to know how open-ended responses could be analyzed.

The questionnaire was developed based on the Theory of Planned Behavior (TPB). The focus was on measuring the intention to use autonomous shuttle service. Two formats of the questionnaire were used, the first relies only on Likert scales, while the second uses a combination of Likert scales and open-ended questions.

Before the launch of the final version of the survey, a pilot survey was carried out, which helped fine-tune the questionnaire further. The full survey will be launched among staff and students of Technical University of Denmark (DTU). After the collection of the responses, a detailed

exploratory analysis will be carried out to identify patterns. This will also help identify some of the common pitfalls associated with the use of Likert scales, such as overestimation of attitudes, midline/outlier confusions, etc.

An extended abstract summarizing the research findings and the methodological contributions from the STSM were submitted to the “International Association for Travel Behavior and Research (IATBR)” conference, 2018.

### **17. Dr. Ainhoa Serna, MONDRAGON UNIBERTSITATEA, Arrasate-Mondragon (SP)**

**Period:** 12/10/2017 to 12/11/2017

**Host:** Slaven Gasparovic, Department of Geography, Faculty of Science, University of Zagreb (HR)

**STSM Topic:** Transport survey method: using social media big data to study transport behaviour.

#### **Purpose**

The goal of the stay has been to propose a qualitatively and quantitatively approach to investigate the tourists’ satisfaction according by transport mode used. The methodology implemented in the research have included data collection from *TripAdvisor.com* with geographic locations and their integration with statistical territorial data. Sentiment analysis techniques have been applied in order to assess tourists’ perceptions on success factors, which may be used as planning support tools. The case study is focused on Croatia and has demonstrated the complementarity and value of social media-related data jointly with official statistics in tourism planning.

#### **Main results**

- One of the main results have been the elaboration and submission for CIT 2018 Conference.
- Moreover, the results and interpretation obtained of the Sentiment analysis from Social Media.
- Another contribution, is the creation and sharing of a Sentiment Labelled Sentences Data Set as training dataset for supervised learning algorithm and to publish the analysed data set (polarity analysis, positive data set and negative dataset) as Open Data for reuse of researchers from around the world.
- Finally, the elaboration of a data visualization with a dashboard panel.
- The results of the stay have been especially useful in areas related to the mobility of people in urban areas, especially public administrations with responsibility for urban transport.

### **18. Prof. Lidia Zakowska, Cracow University of Technology (PL)**

**Period:** 06/11/2017 - 17/11/2017

**Host:** Francesco Viti, University of Luxembourg (LT)

**STSM Topic:** Social Networks and Human Behaviour

**Scope:**

- Evaluation of the future mobility that is based on social needs in modern societies
- Integration of social mobility and public transport plans with advanced methods of data collection

**19. Mr. Arkadiusz Drabicki, Cracow University of Technology, Kraków (PL)****Period:** 6/11/2017 – 26/11/2017**Host:** Achille Fonzone, Edinburgh Napier University, Edinburgh (UK)**STSM Topic:** Investigation of impact of real-time crowding information systems on passengers' travel behaviour in public transport networks – SP survey design and validation**Scope:**

Designing a passenger survey, which would help us to understand travel behavior in the event of access to realtime crowding information i.e. a novel, feasible ICT (ATIS) solution which is likely to be implemented in urban public transport systems in the near future.

**20. Dr. Stefano Pensa, SiTI – Higher Institute on Territorial Systems for Innovation (IT)****Period:** 12/11/2017 - 24/11/2017**Host:** Pnina Plaut, Technion - Israel Institute of Technology (IL)**STSM Topic:** Social Networks, Social Media usage & Travel Behavior among students in EU countries – Urban data analysis.**Scope:**

Evaluation of travel behaviors and usability of data for urban analysis, based on GIS software

**21. Mr. David Duran Rodas, Technical University Munich, Munich (DE)****Period:** 29/11/2017 – 15/12/2017**Host:** Pnina Plaut, Technion - Israel Institute of Technology (IL)**STSM Topic:** Identification of leisure mobility patterns related to the use of social media**Scope:**

Building a model to identify leisure-related mobility patterns related to the use of social media.

**22. Mr. Yuval Rubinstein, Israel Institute of Technology (IL)****Period:** 10/12/2017 - 24/12/2017**Host:** Stefano Pensa, SiTI – Higher Institute on Territorial Systems for Innovation (IT)**STSM Topic:** Social network - urban data analysis**Scope:**

- Understand the opportunities of extracting mobility related information out of the questionnaire about Social Networks, Social Media usage & Travel Behavior among students in EU countries
- Analyze raw data using Geographic Information Systems
- Provide a literature review document
- Identify a list of potential indicators based on the review

### **23. Dr. Domokos Esztergar - Kiss, Budapest University of Technology and Economics (BME) (HU)**

**Period:** 13/01/2018 - 27/01/2018

**Host:** Odette Lewis, University of Malta (MT)

**STSM Topic:** EU funded research projects in the field of Social networks and travel behaviour

**Scope:**

Initiate a new collaboration framework for the various EU research groups that develops a new transport paradigm based upon ICT social networks and their subsequent travel behavior in the urban environment.

### **24. Dr. Fariya Sharmeen, Radboud Univeristy Nijmegen (NL)**

**Period:** 01/11/2017 – 31/01/2018

**Host:** Prof. Mario Cools, University of Liege (BE)

**STSM Topic:** On the mutual transposition of individuals' social and travel geographies

**Scope:**

Understanding the mutual transposition of social networks and travel behaviour of individuals:

- Understanding spatio-temporal diversity of activity-travel profiles of individuals with reference to accessibility and geographical attributes.
- Estimating the correspondence of (a) with their social network composition and mode of interaction (including the role of social media).

### **25. Mr. Jesper Bláfoss Ingvardson, Technical University of Denmark, Kgs. Lyngby (DK)**

**Period:** 04/01/2018 – 31/01/2018

**Host:** João de Abreu e Silva, CESUR/CEris, Lisbon (PT)

**STSM Topic:** The influence of perceived fairness, equity and social networks on location patterns and public transport use

**Scope:**

- Investigating the interrelationships between travel behavior, peer pressure due to social networks, location patterns and land use characteristics, level of service of public transport, and perceptions of fairness and equity through on line survey results among students in Lisbon and Copenhagen. Re-estimation of models and Paper writing.